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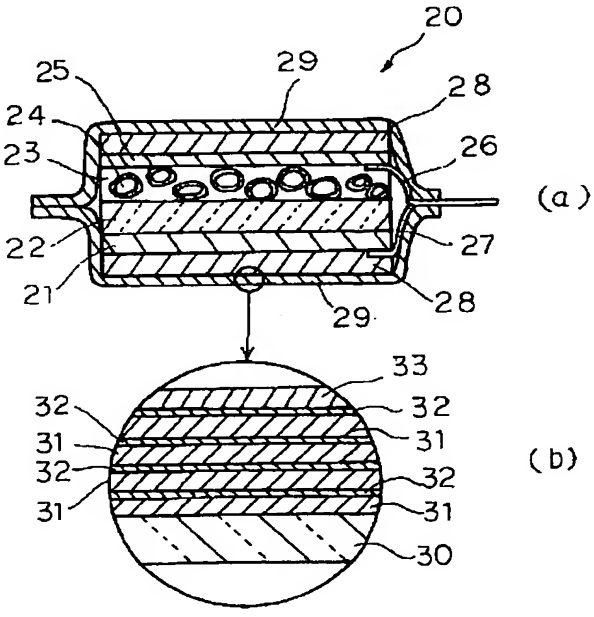
(54)【発明の名称】　電界発光灯

(57)【要約】
【課題】　従来の電界発光灯はフロンを原料とする三弗化塩化エチレンなどの防湿外皮フィルムで封止していたので、環境汚染問題や、高価なこと、厚みが大きいなどの不具合があった。
【解決手段】　透明電極２５と背面電極２１との間に発光層２３と反射絶縁層２２とを配設した電界発光素子を上下から外皮フィルムで挟持して封止した電界発光灯２０において、発光層２３に使用する蛍光体２４は、表面に酸化珪素や窒化珪素などの防湿膜が形成されており、かつ、外皮フィルムはポリエチレンテレフタレート（ＰＥＴ）３１に金属酸化物、窒化珪素などの少なくとも１種の薄膜３２を形成したものを複数積層してなるＰＥＴ積層フィルム２９であることを特徴とする。



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【特許請求の範囲】

【請求項１】透明電極と背面電極との間に発光層と反射絶縁層とを配設した電界発光素子を上下から外皮フィルムで封止した電界発光灯において、前記発光層に使用された蛍光体粒子には防湿膜が形成されており、かつ、前記外皮フィルムは少なくとも片面に金属酸化物および／または窒化珪素からなる防湿性薄膜を形成した透明樹脂フィルムが複数積層されていることを特徴とする電界発光灯。

【請求項２】蛍光体粒子の防湿膜が酸化珪素、酸化アルミニウム、窒化珪素の群から選ばれた一種以上であり、透明樹脂フィルムがポリエチレンテレフタレート（ＰＥＴ）であり、金属酸化物が酸化アルミニウム、酸化珪素、酸化チタンの群から選ばれた一種以上であることを特徴とする請求項１に記載の電界発光灯。

【請求項３】積層数が２～８であることを特徴とする請求項１に記載の電界発光灯。

【請求項４】蛍光体粒子の防湿膜が２層膜であり、第１層がプラズマＣＶＤで形成された酸化珪素であり、第２層がプラズマＣＶＤで形成された窒化珪素であることを特徴とする請求項２に記載の電界発光灯。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は液晶表示装置のバックライトなどに応用される面光源の電界発光灯に関し、特に、従来の三弗化塩化エチレンなどの防湿外皮フィルムを使用しないで、環境汚染問題に対応すると共に、防湿性を向上した電界発光灯に関する。

【０００２】

【従来の技術】従来の電界発光灯について図を用いて説明する。図３は従来の電界発光灯の要部拡大断面図であり、図において１はＡｌ箔などからなる背面電極、２は背面電極１の上に印刷形成された反射絶縁層で、チタン酸バリウムなどの高誘電体粉末をシアノエチルプルランなどの有機バインダ中に分散したものである。３は硫化亜鉛をを銅、ハロゲンなどで付活した蛍光体４をシアノエチルプルランなどの有機バインダ中に分散したものを前記反射絶縁層２の上に印刷形成した発光層である。特に、この蛍光体は表面に防湿膜は形成されていない。５はＩＴＯなどの透明電極を透明フィルムに形成した透明導電フィルムであり、６，７は透明電極と背面電極からそれぞれ導出されたリード電極である。８は例えばナイロン（デュポン社商標）からなる吸湿フィルム、９は透湿性の低い三弗化塩化エチレンなどからなる防湿外皮フィルムである。これらの部材を積層して上下から熱圧着によって封止することにより電界発光灯１０を得る。

【０００３】

【発明が解決しようとする課題】透明電極と背面電極の間に発光層と反射絶縁層とを配設した積層体（電界発光素子）を吸湿フィルムを介して上下から三弗化塩化エチレンなどの防湿外皮フィルムで封止した従来の電界発光灯では、特に防湿外皮フィルムがフロンを原料として作られるため環境を汚染するという問題がある。また、この防湿外皮フィルムは高価であり、厚みも大きいために電界発光灯の低価格化、薄型化に対する障害となっている。

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【０００４】そこで、本発明は上記の問題点に鑑み提案されたもので、環境汚染問題に対応できると共に、防湿性を向上して寿命を向上した、薄型かつ安価な電界発光灯を提供することを目的とする。

【０００５】

【課題を解決するための手段】本発明の電界発光灯は、透明電極と背面電極との間に発光層と反射絶縁層とを配設した積層体を上下から外皮フィルムで挟持して封止してなり、前記発光層に使用された蛍光体粒子には防湿膜が形成され、かつ、前記外皮フィルムは少なくとも片面に金属酸化物および／または窒化珪素からなる防湿性薄膜を形成した透明樹脂フィルムを複数積層してなることを特徴とする。また、蛍光体粒子の防湿膜が酸化珪素、酸化アルミニウム、窒化珪素の群から選ばれた一種以上であり、透明樹脂フィルムがポリエチレンテレフタレート（ＰＥＴ）であり、金属酸化物が酸化アルミニウム、酸化珪素、酸化チタンの群から選ばれた一種以上であることを特徴とする。また、防湿性薄膜を形成した透明樹脂フィルムの積層数が２～８であることを特徴とする。また、蛍光体粒子の防湿膜が２層膜であり、第１層がプラズマＣＶＤで形成された酸化珪素であり、第２層がプラズマＣＶＤで形成された窒化珪素であることを特徴とする。

【０００６】

【発明の実施の形態】本発明の電界発光灯は、防湿膜で被覆した硫化亜鉛系蛍光体を樹脂バインダに分散した発光層と、チタン酸バリウムなどの高誘電体粉末を樹脂バインダに分散した反射絶縁層とを、ＩＴＯなどの透明電極を透明フィルムに形成した透明導電フィルムとアルミニウム箔などの背面電極との間に配設した積層体を、上下からポリエチレンテレフタレートの積層フィルム（以下、ＰＥＴ積層フィルムと称する）で挟着封止した構造を有し、特にＰＥＴ積層フィルムはＰＥＴフィルムの少なくとも片面に防湿性薄膜として金属酸化物薄膜、窒化珪素薄膜の少なくとも１種を形成したものを複数積層してなることを特徴とする。また、前記積層体をＰＥＴ積層フィルムで挟着封止するに際し、ナイロンなどの吸湿フィルムを介在させ水分の影響をさらに小さくすることもできる。また、金属酸化物薄膜としては酸化アルミニウム、酸化珪素、酸化チタンなどが好適し、薄膜は材料によって若干異なるが２００～１０００Åが好適し、ＰＥＴフィルムの積層数は２～８が好適する。また、蛍光体を被覆する防湿膜も金属酸化物、窒化珪素のうち一種以上が使用可能であり、特に１層目を酸化珪素として２

層目を窒化珪素とした２層構造のものが好適する。

【０００７】

【実施例】以下、本発明の実施例について、図面を用いて説明する。図１（ａ）は本発明のＰＥＴ積層フィルムで挟着封止された電界発光灯２０の断面図で、図１（ｂ）は金属酸化物薄膜として酸化アルミニウムの薄膜を形成した４層構成のＰＥＴ積層フィルムの断面図である。図において、２１はアルミニウム箔などの背面電極、２２は背面電極２１の上に印刷形成された反射絶縁層で、チタン酸バリウムなどの高誘電体粉末をフッ素ゴムなどのフッ素樹脂系バインダに分散したものである。２３は反射絶縁層２２の上に印刷形成された発光層で、硫化亜鉛を母体とし銅、ハロゲン、アルミニウムなどで付活した蛍光体粒子の表面にプラズマＣＶＤ法で酸化珪素を被覆した後、アニールし、さらにプラズマＣＶＤ法で窒化珪素を被覆した防湿被覆蛍光体２４をフッ素ゴムなどのフッ素樹脂系バインダに分散したものである。２５はＰＥＴなどの透明フィルムにＩＴＯなどの透明電極を蒸着またはスパッタリングなどで形成した透明導電フィルムである。２８はナイロンなどの吸湿フィルムであり、２９は本発明の防湿性薄膜を形成したＰＥＴ積層フィルムである。また、２６，２７は透明電極と背面電極からそれぞれ導出したリード電極である。なお、吸湿フィルム２８は本発明において必須の構成要素ではなく除去してもよい。

【０００８】次に、本発明の電界発光灯２０の製造方法について簡単に説明する。背面電極２１の上に反射絶縁層２２、発光層２３をドクター印刷、スクリーン印刷などで積層形成し、透明導電フィルム２５の透明電極側と発光層２３とを当接した構体を熱圧着して積層体を形成する。次に、該積層体の上下にナイロンなどの吸湿フィルム２８を介在してＰＥＴ積層フィルム２９で上下から挟持し、熱圧着で封止する（各層を積層配設して後、１回の熱圧着で形成してもよい。）。

【０００９】一方、ＰＥＴ積層フィルム２９は図１（ｂ）に示すように、基材となる厚み１００μｍのベースＰＥＴフィルム３０の上に厚さ５μｍのＰＥＴフィルム３１の片面に酸化アルミニウムの薄膜３２を蒸着で５００Å形成したものを接着剤（図示しない）を介して複数層（例えば４層）重ね合わせ熱圧着して形成する。ベースＰＥＴフィルム３０は補強材であり、工程中、熱圧着時などに変形して酸化アルミニウム薄膜にクラックが生じたり傷がつくことなどを防止するために必要なものである。ＰＥＴフィルム３１が強度的に十分な厚さを有するものであればベースＰＥＴフィルム３０は必ずしも必要ではない。ＰＥＴフィルム３１は電界発光灯の全体の厚み、および輝度の点からは極力薄い方がよいが、耐湿性や製造工程（薄膜形成、積層など）での歩留などを考慮するとある程度の厚みは必要であり、３～２０μｍが好適する。なお、３３は接着剤層である。

【００１０】ＰＥＴフィルム３１に形成する防湿性薄膜は酸化アルミニウムのほかに、酸化珪素、酸化チタン、酸化イットリウム、酸化タンタル、チタン酸バリウム，チタン酸ジルコニウムなどの金属酸化物の１種以上、窒化珪素（Ｓｉｘ Ｎｙ）、およびこれらを積層したものなどが使用できる。形成方法は電子ビーム蒸着、スパッタリング、ＣＶＤなど一般的な薄膜形成方法が使用できる。膜厚は材料によっても若干異なるが防湿能力、透過率などを考慮して実用的には２００～１０００Åが好適する。

【００１１】防湿性薄膜を形成したＰＥＴフィルムの積層数は、防湿能力、透過率、厚み、材料コスト、製造歩留などを考慮して選択される。実用的には２～８層が望ましく、特に４～６層が最適である。積層に際し、薄い接着剤を介在させる。接着は熱圧着により行う。

【００１２】次に蛍光体に防湿膜を形成する方法について説明する。使用する装置は概略次の通りである。すなわち、真空槽には上下一対の電極が対向配置され、また、電極間に原料ガスを供給するための複数のパイプが取り付けてある。下部電極は上方に開口した容器であり、振動可能なようにバネ材を介して真空槽底面に設置されている。容器の内壁には螺旋状の搬送路が形成されている（始端は容器底部に接続され、終端は容器の中央部上方に位置している）。容器の底部外面には容器を振動させるための加振手段が接続されている。その他、容器を加熱する手段も設置されている。

【００１３】上記の装置を用いて蛍光体に１層目の酸化物を形成する。まず、未処理の蛍光耐粒子を容器の底部に供給し、真空槽を減圧し、第２のパイプから酸素ガスを流量１００～１５００ＳＣＣＭに保って供給する。次に、上下電極間に高周波電力（１３．５６ＭＨｚ，２００～７００Ｗ）を供給して酸素ガスプラズマを発生させる。ここで、容器を振動させ蛍光体粒子を搬送路を経由して循環させる。続いて、第１のパイプから第１の原料ガス、例えばテトラエトキシシランガスを１～５０ＳＣＣＭに保って供給し、真空槽内の圧力を１００Ｐａ以下に保つ。この状態を所定時間維持することにより、蛍光体粒子の表面にプラズマＣＶＤによって第１の皮膜として酸化珪素の薄膜を１０００～３０００Å形成する。蛍光体粒子は容器内を搬送路に沿って回転しながら移動するので表面に均一に酸化珪素の皮膜が形成される。

【００１４】第１の皮膜を形成した蛍光体粒子を真空槽から取り出し、耐熱容器に入れ、炉に移して大気中でアニールする。アニール条件は保持温度５００～８５０℃、保持時間１～６０分が輝度、寿命の点で好適する。アニール雰囲気は大気のほか、酸素中、水蒸気中など酸素を含む酸化性雰囲気が好適する。アニールすることにより第１の皮膜の付着強度が増加し蛍光体粒子の保護膜としての性能が向上する。

【００１５】次に、アニール処理された蛍光体粒子を真

空槽の容器に供給し、同様にして第２の皮膜として窒化珪素を１０００～４０００Å形成する。この場合、第２のパイプからアンモニアガスを１０～３００ＳＣＣＭ供給し、第１のパイプからジクロロシランガスを１～５０ＳＣＣＭ供給して行う。この際、良質の窒化膜を形成するため容器を３００～９００℃、望ましくは、５００～８００℃に加熱する。金属酸化物からなる第１の皮膜を形成しているために、耐熱性が向上し、窒化膜形成時の高温処理による蛍光体の劣化を防止でき、緻密な窒化膜を形成することができる。

【００１６】次に、本発明と従来技術により作成された電界発光灯について、高温高湿下での動作条件（５０℃，９０％ＲＨ，１００Ｖ，４００Ｈｚ）における動作時間と輝度維持率および寿命（初輝度に対し輝度が５０％になる動作時間）との関係を図２に示す。図２から明らかなように、本発明の電界発光灯は三弗化塩化エチレンからなる防湿外皮フィルムを使用しないにもかかわらず寿命が従来品よりも向上している。ＰＥＴフィルムは三弗化塩化エチレンにくらべて防湿性はやや劣るが、酸化アルミニウムなどの防湿性薄膜を形成したＰＥＴ積層フィルムにしていること、および蛍光体粒子の表面に防湿膜を形成していることの相乗効果によるものである。特に、蛍光体粒子に形成した防湿膜の膜厚、膜質が変動して防湿能力に変動が生じてもＰＥＴ積層フィルムを併用しているために、総合的な防湿能力の変動は低く抑えられる。

【００１７】次に、電界発光灯の厚みについて説明する。本発明のＰＥＴ積層フィルムの厚さは、ベースＰＥＴフィルムが約１００μｍ、防湿性薄膜を形成したＰＥＴフィルムが一層あたり約５μｍ、接着剤層が全体で約５０μｍであるから積層数を最大８としてもＰＥＴ積層フィルムの厚みは約１９０μｍであり、従来の三弗化塩化エチレンからなる外皮フィルムの約２５０μｍにくらべて約６０μｍほど薄くなり、電界発光灯全体としては約１２０μｍほど薄くなり、従来の電界発光灯にくらべて約３／４以下に薄型化できる。

【００１８】次に、コストについて説明する。本発明のＰＥＴ積層フィルムは低価格であり、従来の三弗化塩化エチレンからなる外皮フィルムにくらべて１／４の価格である。したがって、本発明で使用する防湿膜を形成した蛍光体が防湿膜を形成しない従来の蛍光体よりも若干高価になるが、十分に吸収でき、電界発光灯全体としては従来のものよりも安価になる。

【００１９】

【発明の効果】本発明によれば、蛍光体粒子の表面に防湿膜を形成したこと、および防湿性薄膜を形成したＰＥＴフィルムを積層したもので封止したため、環境を汚染することなく、防湿性を向上して寿命を向上した薄型かつ安価な電界発光灯を提供することができる。

【図面の簡単な説明】

【図１】　本発明の一実施例の電界発光灯の要部拡大断面図（ａ）とＰＥＴ積層フィルムの要部拡大断面図（ｂ）

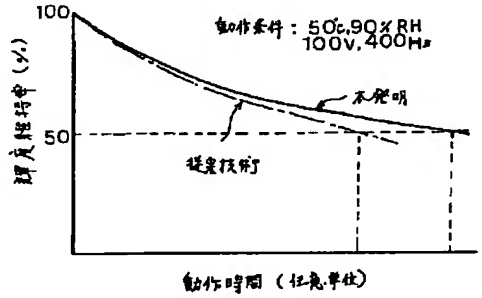
【図２】　本発明の電界発光灯の輝度－動作時間特性を従来技術と比較したグラフ

【図３】　従来の電界発光灯の要部拡大断面図

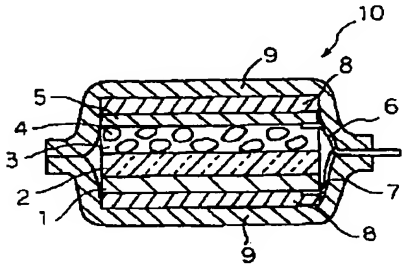
【符号の説明】

２０　電界発光灯
２１　背面電極
２２　反射絶縁層
２３　発光層
２４　防湿被膜蛍光体
２５　透明導電フィルム
２６，２７　リード電極
２８　吸湿フィルム
２９　ＰＥＴ積層フィルム（防湿外皮フィルム）
３０　ベースＰＥＴフィルム
３１　ＰＥＴフィルム
３２　防湿性薄膜
３３　接着剤層

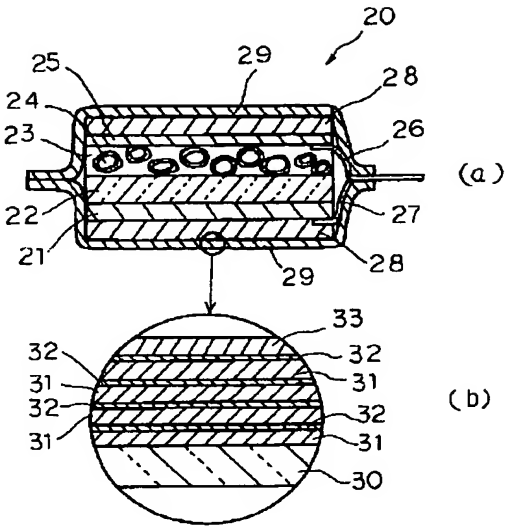
【図２】



【図３】



【図１】



【手続補正書】
【提出日】平成８年８月２８日
【手続補正１】
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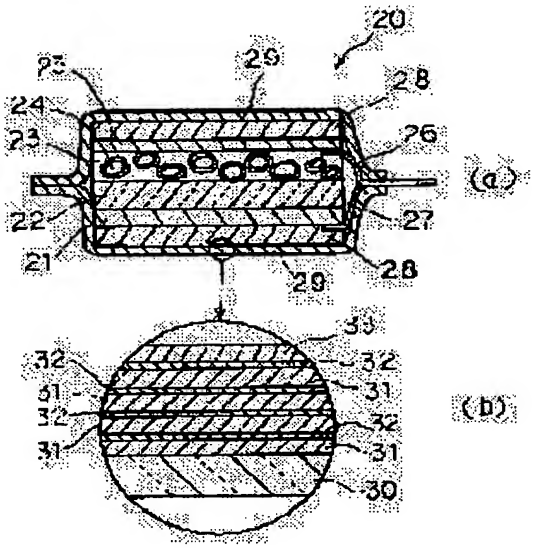
(54) ELECTROLUMINESCENT LIGHT

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a thin, inexpensive electroluminescent light capable of coping with environment contamination problems, improving its moisture resistance property, and improve its service life.
SOLUTION: This electroluminescent light 20 pinches and seals an electroluminescent element at which a light emitting layer 23 and a reflection insulation layer 22 are arranged between a crystal electrode 25 and a rear face electrode 21 from a top and a bottom by means of an outer skin film. In this case, a phosphor 24 used for the light emitting layer 23 is formed with a moisture resistance film such as silicon oxide or silicon nitride on its surface, and the outer skin film is a plurality of PET lamination films 29 laminating formation of at least one type of a thin film 32 such as metal oxide or silicon nitride for polyethylene phthalate (PET) 31.



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[Date of request for examination]	14.05.1998
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[Date of extinction of right]	

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] It is the electroluminescence LGT which a moisture proof film is formed in a fluorescent substance particle used for said luminous layer in an electroluminescence LGT which closed electroluminescence devices which arranged a luminous layer and a reflective insulating layer between a transparent electrode and a back plate with an envelope film from the upper and lower sides, and is characterized by carrying out two or more laminatings of the transparence resin film in which a dampproof thin film with which said envelope film becomes at least one side from a metallic oxide and/or silicon nitride was formed.
[Claim 2] An electroluminescence LGT according to claim 1 characterized by being more than a kind as which a moisture proof film of a fluorescent substance particle was chosen from a group of oxidation silicon, an aluminum oxide, and silicon nitride, and for a transparence resin film being polyethylene terephthalate (PET), and being more than a kind as which a metallic oxide was chosen from a group of an aluminum oxide, oxidation silicon, and titanium oxide.
[Claim 3] An electroluminescence LGT according to claim 1 characterized by the numbers of laminatings being 2-8.
[Claim 4] An electroluminescence LGT according to claim 2 characterized by for a moisture proof film of a fluorescent substance particle being a two-layer film, being oxidation silicon with which the 1st layer was formed by plasma CVD, and being the silicon nitride with which the 2nd layer was formed by plasma CVD.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the electroluminescence LGT which improved dampproofing while coping with an environmental pollution problem, without using moisture proof envelope films, such as the conventional 3 fluoridation ethylene chloride, especially about the electroluminescence LGT of the surface light source applied to the back light of a liquid crystal display etc.
[0002]
[Description of the Prior Art] The conventional electroluminescence LGT is explained using drawing. Drawing 3 is the important section expanded sectional view of the conventional electroluminescence LGT, the back plate with which 1 consists of an aluminum foil etc. in drawing, and 2 are the reflective insulating layers by which printing formation was carried out on the back plate 1, and high dielectric powder, such as barium titanate, is distributed in organic binders, such as a cyano ethyl pullulan. 3 is the luminous layer which carried out printing formation of what distributed the fluorescent substance 4 which activated ********** with copper, a halogen, etc. in organic binders, such as a cyano ethyl pullulan, on said reflective insulating layer 2. Especially the moisture proof film is not formed in the surface for this fluorescent substance. 5 is the transparence electric conduction film which formed transparent electrodes, such as ITO, in the bright film, and 6 and 7 are the lead electrodes drawn from the transparent electrode and the back plate, respectively. The moisture absorption film with which 8 consists of nylon (Du Pont trademark), and 9 are moisture proof envelope films which consist of a low 3 fluoridation ethylene chloride of moisture permeability etc. Electroluminescence LGT 10 is obtained by carrying out the laminating of these members and closing by thermocompression bonding from the upper and lower sides.
[0003]
[Problem(s) to be Solved by the Invention] Especially with the conventional electroluminescence LGT which closed the layered product (electroluminescence devices) which arranged the luminous layer and the reflective insulating layer between the transparent electrode and the back plate with moisture proof envelope films, such as a 3 fluoridation ethylene chloride, from the upper and lower sides through the moisture absorption film, since a moisture proof envelope film is made considering chlorofluocarbon as a raw material, there is a problem of polluting environment. Moreover, this moisture proof envelope film is expensive, and since thickness is also large, it has been a failure over low-pricing of an electroluminescence LGT, and thin-shape-izing.
[0004] Then, it aims at offering the thin and cheap electroluminescence LGT which improved dampproofing and improved the life while this invention was proposed in view of the above-mentioned trouble and could cope with the environmental pollution problem.
[0005]
[Means for Solving the Problem] A moisture proof film is formed in a fluorescent substance particle which pinched an electroluminescence LGT of this invention with an envelope film from the upper and

lower sides, it came to close a layered product which arranged a luminous layer and a reflective insulating layer between a transparent electrode and a back plate, and was used for said luminous layer, and said envelope film is characterized by coming to carry out two or more laminatings of the transparence resin film in which a dampproof thin film which becomes at least one side from a metallic oxide and/or silicon nitride was formed. Moreover, it is more than a kind as which a moisture proof film of a fluorescent substance particle was chosen from a group of oxidation silicon, an aluminum oxide, and silicon nitride, and a transparence resin film is polyethylene terephthalate (PET), and it is characterized by being more than a kind as which a metallic oxide was chosen from a group of an aluminum oxide, oxidation silicon, and titanium oxide. Moreover, it is characterized by the numbers of laminatings of a transparence resin film in which a dampproof thin film was formed being 2-8. Moreover, a moisture proof film of a fluorescent substance particle is a two-layer film, and it is characterized by being oxidation silicon with which the 1st layer was formed by plasma CVD, and being the silicon nitride with which the 2nd layer was formed by plasma CVD.

[0006]

[Embodiment of the Invention] The luminous layer which distributed the zinc sulfide system fluorescent substance which covered the electroluminescence LGT of this invention with the moisture proof film to the resin binder, The reflective insulating layer which distributed high dielectric powder, such as barium titanate, to the resin binder The layered product which arranged transparent electrodes, such as ITO, among the transparence electric conduction film and back plates, such as aluminium foil, which were formed in the bright film It has the structure which carried out fastening closure with the laminated film (a PET laminated film is called hereafter) of polyethylene terephthalate from the upper and lower sides. It is characterized by especially a PET laminated film coming to carry out two or more laminatings of what formed at least one sort of a metallic-oxide thin film and a silicon nitride thin film at least in one side of a PET film as a dampproof thin film. Moreover, it can face carrying out fastening closure of said layered product with a PET laminated film, moisture absorption films, such as nylon, can be made to be able to intervene, and effect of moisture can also be made still smaller. Moreover, as a metallic-oxide thin film, an aluminum oxide, oxidation silicon, titanium oxide, etc. carry out suitable, although a thin film changes a little with materials, 200-1000A carries out suitable [of it], and 2-8 carry out suitable [of the number of laminatings of a PET film]. Moreover, among a metallic oxide and silicon nitride, more than a kind of the moisture proof film which covers a fluorescent substance is also usable, and the thing of the two-layer structure which used the two-layer eye as silicon nitride by using especially the 1st layer as oxidation silicon carries out suitable.

[0007]

[Example] Hereafter, the example of this invention is explained using a drawing. Drawing 1 (a) is the cross section of electroluminescence LGT 20 by which the fastening closure was carried out with the PET laminated film of this invention, and drawing 1 (b) is the cross section of the PET laminated film of 4 lamination which formed the thin film of an aluminum oxide as a metallic-oxide thin film. In drawing, it is the reflective insulating layer by which 21 was carried out at back plates, such as aluminium foil, and printing formation of 22 was carried out on the back plate 21, and high dielectric powder, such as barium titanate, is distributed to fluororesin system binders, such as a fluororubber. 23 is the luminous layer by which printing formation was carried out on the reflective insulating layer 22, after it covers oxidation silicon with a plasma-CVD method on the surface of the fluorescent substance particle which used zinc sulfide as the parent and was activated with copper, a halogen, aluminum, etc., is annealed and distributes the moisture proof covering fluorescent substance 24 which covered silicon nitride with the plasma-CVD method further to fluororesin system binders, such as a fluororubber. 25 is the transparence electric conduction film which formed transparent electrodes, such as ITO, in bright films, such as PET, by vacuum evaporationo or sputtering. 28 is moisture absorption films, such as nylon, and 29 is the PET laminated film in which the dampproof thin film of this invention was formed. Moreover, 26 and 27 are the lead electrodes drawn from the transparent electrode and the back plate, respectively. In addition, the moisture absorption film 28 is not an indispensable component in this invention, and may be removed.

[0008] Next, the manufacture method of electroluminescence LGT 20 of this invention is explained

briefly. On a back plate 21, laminating formation of the reflective insulating layer 22 and the luminous layer 23 is carried out by doctor printing, screen-stencil, etc., thermocompression bonding of the structure which contacted the luminous layer 23 the transparent electrode side of the transparence electric conduction film 25 is carried out, and a layered product is formed. Next, the moisture absorption films 28, such as nylon, are placed between the upper and lower sides of this layered product, and it pinches from the upper and lower sides with the PET laminated film 29, and closes by thermocompression bonding (laminating arrangement of each class may be carried out, and you may form by 1 time of thermocompression bonding the back.).

[0009] on the other hand, as shown in drawing 1 (b), on the base PET film 30 with a thickness of 100 micrometers it is thin to a base material, through adhesives (there is nothing a drawing example), the PET laminated film 29 carries out two or more layer (for example, four layers) superposition thermocompression bonding of what formed 500A of thin films 32 of an aluminum oxide by vacuum evaporationo, and forms it in one side of the PET film 31 with a thickness of 5 micrometers. The base PET films 30 are reinforcing materials, and they are required in order to deform at the time of in process and thermocompression bonding etc., and for a crack to arise in an aluminum-oxide thin film or to prevent that a blemish sticks etc. If the PET film 31 has thickness sufficient in reinforcement, the base PET film 30 is not necessarily required. Although the thinner one as much as possible is good from the thickness of the whole electroluminescence LGT, and the point of brightness, if the PET film 31 takes into consideration moisture resistance, the yield in manufacturing processes (thin film formation, laminating, etc.), etc., a certain amount of thickness will be required, and 3-20 micrometers will carry out suitable. In addition, 33 is an adhesives layer.

[0010] The dampproof thin film formed in the PET film 31 can use what carried out the laminating of one or more sorts, the silicon nitride (Six Ny), and these of metallic oxides, such as oxidation silicon, titanium oxide, yttrium oxide, tantalum oxide, barium titanate, and a titanic-acid zirconium, other than an aluminum oxide. The formation method can use the general thin film formation methods, such as electron beam evaporation, sputtering, and CVD. Although thickness changes a little also with materials, in consideration of moisture proof capacity, permeability, etc., 200-1000A carries out suitable [of it] practical.

[0011] The number of laminatings of the PET film in which the dampproof thin film was formed is chosen in consideration of moisture proof capacity, permeability, thickness, material cost, a manufacture yield, etc. 2-8 layers are desirable practical, and 4-6 layers are especially the optimal. Thin adhesives are made to intervene on the occasion of a laminating. Thermocompression bonding performs adhesion.

[0012] Next, how to form a moisture proof film in a fluorescent substance is explained. the equipment to be used -- an outline -- it is as follows. That is, two or more pipes for opposite arrangement of the electrode of a vertical pair being carried out at a vacuum tub, and supplying material gas to inter-electrode are attached. A lower electrode is the container which carried out the opening to the upper part, and it is installed in the vacuum bottom of the tank side through spring material so that it can vibrate. The spiral conveyance way is formed in the wall of a container (the start edge is connected to a container pars basilaris ossis occipitalis, and termination is located in the center-section upper part of a container). The excitation means for vibrating a container is connected to the bottom outside side of a container. In addition, a means to heat a container is also installed.

[0013] The oxide of the 1st layer is formed in a fluorescent substance using above equipment. First, an unsettled particle-proof [fluorescence] is supplied to the pars basilaris ossis occipitalis of a container, a vacuum tub is decompressed, and oxygen gas is maintained and supplied to a flow rate 100 - 1500SCCM from the 2nd pipe. Next, high-frequency power (13.56MHz, 200-700W) is supplied to vertical inter-electrode one, and the oxygen gas plasma is generated. Here, a container is vibrated and a fluorescent substance particle is circulated via a conveyance way. Then, the 1st material gas, for example, tetra-ethoxy silane gas, is maintained and supplied to 1 - 50SCCM from the 1st pipe, and the pressure in a vacuum tub is kept at 100Pa or less. By carrying out predetermined time maintenance of this condition, 1000-3000A of thin films of oxidation silicon is formed in the surface of a fluorescent substance particle as the 1st coat by plasma CVD. Since a fluorescent substance particle moves rotating

the inside of a container along a conveyance way, the coat of oxidation silicon is formed in the surface at homogeneity.
[0014] The fluorescent substance particle in which the 1st coat was formed is put into ejection and a heat-resistant container from a vacuum tub, and it moves to a furnace, and anneals in atmospheric air. Retention temperature [of 500-850 degrees C] and holding-time 1 - 60 minutes carry out suitable [of the annealing conditions] in respect of brightness and a life. The oxidizing atmosphere containing oxygen, such as inside of oxygen besides atmospheric air and a steam, carries out suitable [of the annealing ambient atmosphere]. By annealing, the bond strength of the 1st coat increases and the engine performance as a protective coat of a fluorescent substance particle improves.
[0015] Next, the fluorescent substance particle by which annealing treatment was carried out is supplied to the container of a vacuum tub, and 1000-4000A of silicon nitride is similarly formed as the 2nd coat. In this case, 10-300SCCM supply of the ammonia gas is carried out from the 2nd pipe, from the 1st pipe, 1-50SCCM supply is carried out and dichlorosilane gas is performed. Under the present circumstances, in order to form a good nitride, 300-900 degrees C of containers are desirably heated at 500-800 degrees C. Since the 1st coat which consists of a metallic oxide is formed, thermal resistance can improve, deterioration of the fluorescent substance by high temperature processing at the time of nitride formation can be prevented, and a precise nitride can be formed.
[0016] Next, relation with the operating time, brightness maintenance factor, and life (operating time from which brightness becomes 50% to first brightness) in the operating condition (50 degrees C, 90% RH, 100V, 400Hz) under high-humidity/temperature is shown in drawing 2 about the electroluminescence LGT created by this invention and the conventional technology. Although the electroluminescence LGT of this invention does not use the moisture proof envelope film which consists of a 3 fluoridation ethylene chloride, its life is improving rather than elegance conventionally, so that clearly from drawing 2 . Although dampproofing is a little inferior in a PET film compared with a 3 fluoridation ethylene chloride, it is based on the synergistic effect of making it the PET laminated film in which dampproof thin films, such as an aluminum oxide, were formed, and forming the moisture proof film in the surface of a fluorescent substance particle. Especially fluctuation of moisture proof capacity synthetic since the PET laminated film is used together even if it changes the thickness of the moisture proof film formed in the fluorescent substance particle and membraneous quality and fluctuation arises in moisture proof capacity is suppressed low.
[0017] Next, the thickness of an electroluminescence LGT is explained. A base PET film the thickness of the PET laminated film of this invention About 100 micrometers, Since the PET film in which the dampproof thin film was formed is about 5 micrometers of hits and an adhesives layer is about 50 micrometers on the whole much more, the thickness of a PET laminated film is about 190 micrometers also considering the number of laminatings as a maximum of 8. Compared with about 250 micrometers of the envelope film which consists of the conventional 3 fluoridation ethylene chloride, it becomes thin about about 60 micrometers, and becomes thin [about about 120 micrometers] as the whole electroluminescence LGT, and-izing can be carried out [thin shape] to or less about 3 / 4 compared with the conventional electroluminescence LGT.
[0018] Next, cost is explained. The PET laminated film of this invention is a low price, and are one fourth of prices compared with the envelope film which consists of the conventional 3 fluoridation ethylene chloride. Therefore, although the fluorescent substance in which the moisture proof film used by this invention was formed becomes expensive a little rather than the conventional fluorescent substance which does not form a moisture proof film, it can fully absorb and becomes cheap rather than the conventional thing as the whole electroluminescence LGT.
[0019]
[Effect of the Invention] The thin and cheap electroluminescence LGT which improved dampproofing and improved the life can be offered without polluting environment, since according to this invention it is what carried out the laminating and having formed the moisture proof film in the surface of a fluorescent substance particle and the PET film in which the dampproof thin film was formed were closed.

[Translation done.]

* NOTICES *

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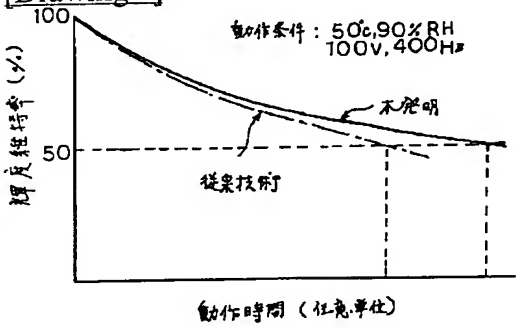
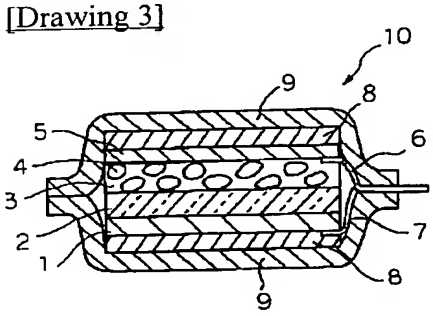
DRAWINGS

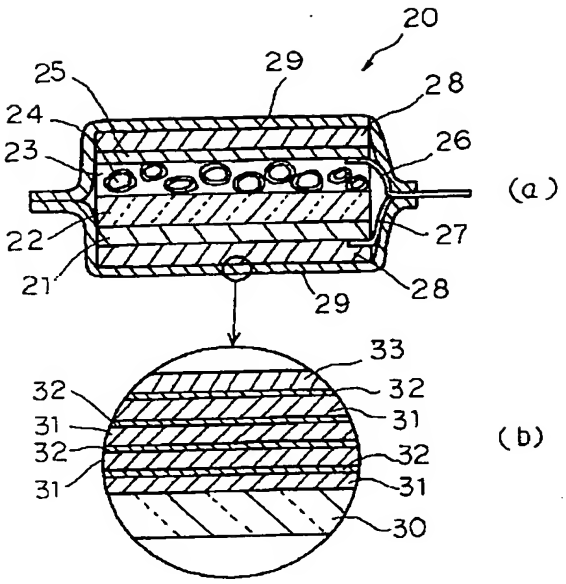
[Drawing 2]



[Drawing 3]



[Drawing 1]



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